

Nonmarine Cretaceous Ostracods from Inner Zone of SW Japan

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(Received December 24, 1995)

Abstract In this paper, twenty-four species of nonmarine Cretaceous ostracods in 7 genera (*Cypridea*, *Rhinocypris*, *Ziziphocypris*, *Mongolocypis*, *Timiriasevia*, *Candona* and *Darwinula*) are described from Kitakyushu, Yamaguchi, Hiroshima, Okayama and Hida areas of SW Japan. Eighteen forms of them are from the Lower Cretaceous rocks and 6 forms from the Upper Cretaceous. Based on their appearance, the correlation concerning Cretaceous ostracod-bearing strata between eastern China and southwestern Japan has also been discussed.

Introduction

In November of 1994, the present writer visited several Cretaceous ostracod localities of the Inner Zone of SW Japan (Fig. 1) with Drs. M. OTA and Y. YABUMOTO of the Kitakyushu Museum and Institute of Natural History, Prof. CHANG Mee-mann and Dr. JIN Fan of the Institute of Vertebrate Paleontology and Paleoanthropology, Academia Sinica, and her colleague Prof. CHEN Pei-ji. We collected a lot of ostracod fossils. Another small collection described here was found by Dr. CHEN Jinhua of Nanjing Institute of Geology and Paleontology, Academia Sinica from the Kitadani Formation in Hida area during his stay in Japan from April to May of 1994. Because it is impossible to sample in detail during these short visitings and also due to ill-preserved fossil ostracods by strong extruding deformation of rocks in Japanese Island, these specimens described in this paper are mostly external or internal moulds of valve and their surface ornamentation of shell is not well-preserved though the analysing process of samples was a difficult and time-consuming work. Even so, this result provides importantly paleontological evidences for nonmarine Cretaceous correlation between SW Japan and E China and might probably be new contribution for the researching on the Cretaceous freshwater ostracods.

The Yamaji Shale of the Inakura Formation in Ibara district of Okayama Prefecture is extremely rich in ostracod fossils dominated with forms of *Cypridea*, secondly are *Rhinocypris* and *Ziziphocypris* from these grey-black mudstone; *Timiriasevia* and *Darwinula* are relatively rare. Among them, *Cypridea anhwaensis* YE & GOU, *Rhinocypris jurassica jurassica* (MARTIN) and *Ziziphocypris simakovi* (MANDELSTAM) are

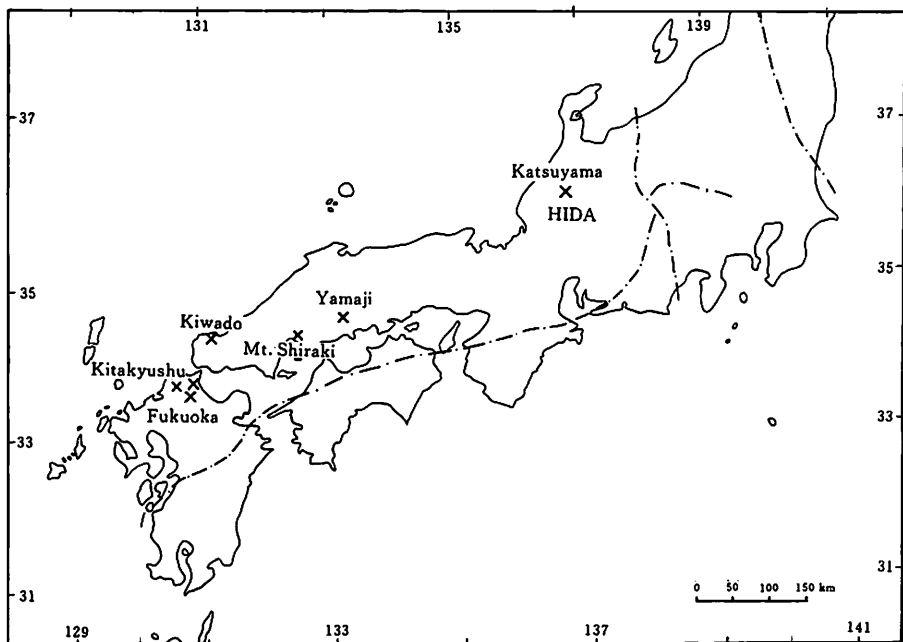


Fig. 1. Map showing the localities of ostracod fossils.

frequent forms of the Shouchang Formation in Zhejiang Province of SE China, whereas some abundant and large-sized *Cypridea* are very similar to *Cypridea linghaiensis* YANG & YE and *Cypridea yangtzensis* YANG & YE from the Guantou Formation in the same area of SE China. It could be assumed that the ostracod fauna of the Yamaji Shale is perhaps between those of the Shouchang and Guantou Formations in age, and the preserved mould of whole individual shell in most cases of this fauna indicates these fossil ostracods were deposited *in situ*.

The fossil ostracods of the Wakino Subgroup in Kitakyushu area are collected from the Sengoku Formation (W_1) at Dobaru, the Lower Wakamiya Formation (W_3) at Minamigaoka, the Upper Wakamiya Formation (W_4) at Kumagai of Kokura-kita-ku and Yurino of Wakamiya district. They are not for rich in quantity and monotonous in taxa, representing only by *Cypridea* with exception of *Rhinocypris* from W_4 at Yurino. The subgenus *Cypridea* (*Cyamocypris*) was living in very limited environment and found only from the Guantou Formation in Lishui City of SE China and the equal horizon in Hexi corridor of NW China in the past. *C. (Cyamocypris) oblonga* YE & Gou and *C. (C.) parva* YE & Gou containing in W_1 at Dobaru, south of Kokura-minami-ku were firstly collected from the Guantou Formation of SE China, but *Cypridea* from W_3 and W_4 at Minamigaoka and Kumagai are similar to *Cypridea anhuaensis* from the Yamaji Shale in Ibara district in having irregular spine-shaped nodes. The Upper Wakamiya Formation (W_4) at Yurino yields *Cypridea kyushuensis*

(sp. n.), *C. sp. 3*, *C. sp. 4*, *C. sp.*, *Rhinocypris sp. 1* and *R. sp. 2*. They are more related to those forms from the late Lower Cretaceous deposits such as Guantou and Kitadani Formations, but without characteristic *Cypridea* (*Morinia*) and *Cypridea* (*Bisulcocypridea*) of this time. Thus, it is difficult to correlate whether early or late Lower Cretaceous strata with surrounding areas.

The Kitadani Formation, top of the Akaiwa Group, is dinosaur and bivalve-bearing horizon in Hida area. Recently Drs. M. MATSUKAWA and J. CHEN found some ostracod and charophyte fossils associated with *Plicatounio* and *Trigonioides* from this formation in "dinosaur quarry" near Sugiyama River, Katsuyama City. These ostracod fossil are well-preserved in greyish black calcareous mudstone, including *Cypridea angusticaudata* CAO & YANG, *C. (Morinia) monosulcata zhejiangensis* YE, *C. (Bisulcocypridea) sp.* and *Timiriasevia sp.*. They are typical forms for the Guantou Formation of SE China and equal horizons in SW China, such as the Puchanghe Formation of Yunnan Province. The Kitadani and Guantou Formations are certainly belong to the same biogeographic province during the late Lower Cretaceous along the Pacific coastal volcanism zone, even if the diversity of ostracods from the Kitadani Formation is lower than in the Guantou Formation due to only one sample to be occasionally discovered by bivalve researchers.

Nonmarine Upper Cretaceous ostracods of SW Japan were found from the black shale within clastic volcanic rocks of the Ohmi Formation of the Abu Group associated with conchostracan fossils *Linhaiella* aff. *ovata* CHEN & SHEN at Kiwado of Yamaguchi Prefecture, and identified by the present writer as *Mongolocypris sp.* and *Ziziphocypris sp.* (CHEN *et al.*, 1993). In 1994, we visited this locality and collected a lot of specimens. Large-sized *Mongolocypris* is the dominated form of the Kiwado ostracod fauna associated with a few *Candona*, *Rhinocypris* and *Ziziphocypris*. It was found from the Upper Cretaceous rocks of Mongolia, and from the latest Lower Cretaceous to Upper Cretaceous deposits in China. The features of this fauna are similar to those of the upper member of the Hekou Formation in Fujian Province and of the Jiadian Formation in Hubei Province of China, showing an early Upper Cretaceous in age, because from Kiwado ostracod fauna has never been found *Talicypridea* which is widely distributed in the late Upper Cretaceous strata in China, Mongolia, Russia, India, Congo and Argentina.

Mongolocypris has also collected from the tuffaceous mudstone at Mt. Shiraki of Hiroshima Prefecture, but they are most moulds of shell with extruding deformation. This tuffaceous mudstone might perhaps correlated to the Ohmi Formation at Kiwado of Yamaguchi Prefecture.

All specimens described in this paper are deposited in the Nanjing Institute of Geology and Palaeontology, Academia Sinica.

Systematic Palaeontology
Subclass Ostracoda LATREILLE, 1806
Order Podocopida MÜLLER, 1894
Suborder Podocopina SARRS, 1866
Superfamily Cypridacea BAIRD, 1845
Family Cyprididae BAIRD, 1845
Subfamily Condoninae KAUFFMANN, 1900
Genus *Candona* BAIRD, 1945
***Candona cf. disjuncta* HAO**

(Pl. 5, figs. 7-9)

Description: Carapace small, subreniform in lateral view; anterior margin rounded, posterior margin oblique in the upper half and its lower half obtusely rounded, inner lamella of anterior margin obviously more broad than the posterior one; dorsal margin slightly arched; ventral margin concave especially at its antero-central part; heighest at about three fourth to posterior of the carapace.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126447	left internal mould	0.82	0.40
126448	left internal mould	0.80	0.37
126449	right internal mould	0.77	0.35

Remarks: All these specimens are moulds of left or right valves. It is similar to *Candona disjuncta* HAO from the Nenjiang Formation of NE China.

Locality and Horizon: Kiwado of Yamaguchi Prefecture; Upper Cretaceous Ohmi Formation of Abu Group.

Family Cyclocyprididae KAUFFMANN, 1900
Subfamily Cyclocypridinae KAUFFMANN, 1990
Genus *Ziziphocypris* CHEN, 1965
***Ziziphocypris costata* (GALEEVA)**

(Pl. 5, fig. 13)

- 1955 *Timiriasevia costata* GALEEVA, p. 62, pl. 15, figs. 9a-d.
 1965 *Ziziphocypris costata* (GALEEVA), CHEN, p. 15, pl. 2, figs. 1-5.
 1980 *Ziziphocypris costata* (GALEEVA), YE *et al.*, p. 180-182, pl. 1, fig. 12.
 1983 *Ziziphocypris costata* (GALEEVA), GOU, p. 47, pl. 2, figs. 13-15.

There are only two external moulds of single valve sculptured by longitudinal ribs intercalated with 3-4 slender striae in between in the surface of carapace. They

are showing the principal characters of this species.

Locality and Horizon: Same as above-mentioned species.

***Ziziphocypris simakovi* (MANDELSTAM)**

(Pl. 5, fig. 12)

- 1955 *Timiriasevia simakovi* MANDELSTAM, GALEEVA, p. 63, pl. 15, figs. 8a-d.
 1965 *Ziziphocypris simakovi* (MANDELSTAM), CHEN, p. 15-16, pl. 2, figs. 6-8.
 1980 *Ziziphocypris simakovi* (MANDELSTAM), YE *et al.*, p. 181, pl. 1, figs. 10-11.
 1983 *Ziziphocypris simakovi* (MANDELSTAM), GOU, p. 47, pl. 2, fig. 12.

Many samples have been mostly preserved in internal moulds. Among them two external moulds of single valve covered with longitudinal striae and 2-3 peripheral striations running parallel to the entire free margins, indicating the main character of this species.

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture; Yamaji Shale of the Lower Cretaceous Inakura Formation.

Family Ilyocyprididae KAUFFMANN, 1900
Subfamily Ilyocypridinae KAUFFMANN, 1900
Genus *Rhinocypris* ANDERSON, 1941
***Rhinocypris* cf. *jurassica jurassica* (MARTIN)**

(Pl. 5, figs. 1-3)

Carapace small, elliptical in lateral view; anterior margin broader than the posterior, both of them rounded; dorsal margin straight, ventral margin concave; Two short transverse grooves in the antero-dorsal part of carapace, a distinct pit below the posterior proove, three nodules in front of the anterior groove, behind the posterior, and in between respectively; surface of carapace ornamented with tubercles and spines; heighest in anterior third.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126439	left internal mould	0.52	0.30
126440	left internal mould	0.55	0.35
126441	right internal mould	0.59	0.31
126442	right internal mould	0.54	0.27

Remarks: The present specimens from the Yamaji Shale are rich in quantity but ill-preserved in moulds. Their outline of carapace and sculpture in surface are similar to *Rhinocypris jurassica jurassica* (MARTIN) from the Lower Cretaceous deposits.

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture; Yamaji Shale of the Lower Cretaceous Inakura Formation.

***Rhinocypris* sp. 1**

(Pl. 5, fig. 4)

Carapace small, subelliptical in lateral view; anterior margin broadly rounded obliquely posterior margin narrow rounded; dorsal margin straight and long, ventral margin slightly concave; the heighest at about one fourth from the anterior end of carapace; two dorsal grooves in the surface, three nodules in front of anterior groove, behind the posterior and in between respectively, in addition more than 10 smaller nodules distributed scatteredly in surface of carapace.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126443	right valve	0.53	0.26
126444	broken right valve	0.57	0.25

Locality and Horizon: Yurino of Wakamiya area, Fukuoka Prefecture; Upper Wakamiya Formation of the Wakino subgroup, Kwanmon Group.

***Rhinocypris* sp. 2**

(Pl. 5, fig. 5)

This is a left valve of small size, elliptical in lateral view; anterior margin broadly rounded, posterior margin narrowly rounded; dorsal margin straight, ventral margin concave; two short transverse grooves at anterodorsal part of carapace, a distinct pit below the posterior groove, three nodules before the anterior groove, behind the posterior, and in between respectively; smooth surface without tubecles or spines.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126445	left valve	0.56	0.34

Locality and Horizon: Yurino of Wakamiya area, Fukuoka Prefecture; Upper Wakamiya Formation (W4) of the Wakino Subgroup, Kwanmon Group.

***Rhinocypris* sp. 3**

(Pl. 5, fig. 6)

A lot of specimens, but ill-preserved; carapace small, subovate in lateral view; dorsal margin nearly straight, ventral margin slightly convex, anterior margin broadly rounded, posterior rounded; highest in antero third; two transverse grooves short and shallow at antero-dorsal part with a distinct pit below the posterior groove, three nodules located before the anterior groove behind the posterior and in between respectively, the middle nodule a little bigger than another two nodules; surface sculptured with tubercles.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126446	right valve	0.46	0.24

The outline of carapace and the sculpture of surface are very similar to *Rhinocypris yongkangensis* GOU & YE from the late Lower Cretaceous Guantou Formation of Zhejiang Province, SE China.

Locality and Horizon: Kiwado, Yamaguchi Prefecture of SW Japan; Upper Cretaceous Ohmi Formation of the Abu Group.

Subfamily Cyprideinae MARTIN, 1940**Genus *Cypridea* BOSQUER, 1852*****Cypridea angusticaudata* CAO & YANG**

(Pl. 8, figs. 7–9)

1977 *Cypridea angusticaudata* CAO & YANG, YE *et al.*, P. 220, pl. 7, figs. 23–24.

Description: Carapace of moderate size, subovate in lateral view; anterior margin broadly rounded, posterior margin narrow rounded, dorsal margin nearly straight in the middle part and oblique in the posterior part, ventral margin slightly curved downwards; the highest at one fourth from the anterior end of carapace which is relatively convex; beak thin and long, notch deep; surface ornamented with fine reticulations.

Remarks: the present specimens from the Kitadani Formation of Japan are closely relating to *Cypridea angusticaudata* CAO & YANG collected from the late Lower Cretaceous deposits of Yunnan Province, SW China in having similar outline of carapace and ornamentation of surface.

Locality and Horizon: Sugiyama River, Katsuyama City, Hida; late Lower Cretaceous Kitadani Formation of the Akaiwa Subgroup, Tetori Group.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126496	right valve	0.83	0.45
126497	right valve	0.83	0.48
126498	right valve	0.91	0.57
126499	right valve	0.83	0.46

***Cypridea cf. anhuaensis* YE & GOU**

(Pl. 6, figs. 1-7)

Many moulds of valves, carapace moderate, subovate or long-oval in lateral view; anterior margin broadly and obliquely rounded and the posterior rounded, dorsal margin nearly straight and the ventral slightly convex; antero-dorsal angle obvious with the highest of carapace; beak small, notch weak; surface ornamented with irregular spine-shaped tubercles and reticulations.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126458	left internal mould	0.82	0.48
126459	left internal mould	0.98	0.52
126461	left internal mould	0.96	0.62
126462	left internal mould	0.83	0.52
126463	left internal mould	0.82	0.55
126464	left internal mould	1.00	0.52
126465	right internal mould	0.88	0.43

Remarks: These specimens from Yamaji are very similar to *Cypridea anhuaensis* YE & Gou of Zhejiang, SE China in outline of carapace and sculpture of surface.

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture; Yamaji shale of the Lower Cretaceous Inakura Formation.

***Cypridea cf. linghaiensis* YANG & YE**

(Pl. 6, figs. 8-11)

Description: A lot of materials preserved in moulds, carapace relatively large, broadly ovate in lateral view; anterior margin widely rounded with oblique upper part and the posterior slightly narrow, dorsal margin convex and the ventral nearly straight or somewhat curved; the highest near anterior third; beak small, notch shallow, surface smooth; muscle scar pattern distinct in a few specimens, two

mandibular muscle scars in the anterior obliquely of valve and four spots forming semicircular row behind them.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126466	right internal mould	1.15	0.85
126468	right internal mould	1.23	0.85
126467	left internal mould	1.18	0.90
126469	left internal mould	1.28	0.91

Remarks: These materials are relatively similar to *Cypridea linghaiensis* YANG & YE from the Guantou Formation in Linhai city of Zhejiang Province, SE China in outline and size of carapace.

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture; Yamaji Shale of the Lower Cretaceous Inakura Formation.

***Cypridea cf. yangtuensis* YANG & YE**

(pl. 7, figs. 3, 9–13; pl. 8, fig. 11)

Description: Many valves preserved in moulds, carapace relatively large, subovate in lateral view; anterior margin broadly rounded with oblique upper part, posterior margin contracted; the posterior end of left valve narrower than the posterior end of right valve, indicating probably the right valve larger than the left; dorsal margin straight at its middle part, and oblique backwards, ventral margin nearly straight; the highest at about anterior third; beak small, notch shallow, surface smooth or sculptured with fine reticulations.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126477	left internal mould	1.17	0.65
126484	right internal mould	1.35	0.83
126485	right internal mould	1.24	0.78
126486	right internal mould	1.38	0.83
126487	left internal mould	1.48	0.78
126488	left internal mould	1.45	0.87
126502	left internal mould	1.55	0.88

Remarks: The present specimens of Yamaji are very similar to *Cypridea yangtuensis* YANG & YE from the Guantou Formation in Zhejiang Province, SE China in outline (especially right valve), but it differs from the latter in having larger

carapaces.

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture of SW Japan; Yamaji Shale of the Lower Cretaceous Inakura Formation.

***Cypridea* sp. 1**

(Pl. 6, figs. 12–13)

There are only several external or intrnal moulds of single valves, carapace small, suboblong in lateral view; anterior margin somewhat broader than the posterior and both of them rounded; dorsal margin slightly convex and the ventral somewhat concave; beak large, notch distinct, surface ornamented with obviously fine reticulations.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126471	right internal mould	0.73	0.41
126472	external mould	0.73	0.36

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture of SW Japan; Yamaji shale of the Lower Cretaceous Inakura Formation.

***Cypridea* sp. 2**

(Pl. 7, figs. 6–8)

These materials less in quantity and ill-preserved by extruding deformation and breaking, carapace moderate, irregular long-oval in lateral view; anterior margin broadly rounded with oblique upper part, posterior margin narrowly rounded; dorsal margin nearly straight, ventral margin slightly convex; beak small, notch obvious, surface with reticulations and nodules.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126480	right internal mould	0.90	0.60
126482	right internal mould	1.01	0.56
126483	left internal mould	0.92	0.56
126481	left internal mould	0.88	0.58

Remarks: The outline and surface sculpture of these carapaces from Kokura area are relatively similar to *Cypridea* cf. *anhuaensis* YE & Gou of the Inakura

Formation in Yamaji of Ibara city, Okayama Prefecture.

Locality and Horizon: Minamigaoka of Kokura-kita-ku, Kitakyshu City of SW Japan; Lower Wakamiya Formation (W₃) of the Wakino Subgroup, Kwanmon Group.

***Cypridea* sp. 3**

(pl. 8, fig. 10)

Carapace small, subelliptical in lateral view; anterior margin broadly rounded, posterior margin rounded, dorsal margin straight and long obliquely backwards, ventral margin straight; the heighest at about one fifth from the anterior end of carapace; beak small, notch shallow, surface with reticulations.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126501	left valve	0.88	0.50

Locality and Horizon: Yurino of Wakamiya area, Fukuoka Prefecture of SW Japan; Upper Wakamiya Formation (W₄) of the Wakino Subgroup, Kwanmon Group.

***Cypridea* sp. 4**

(Pl. 5, fig. 11)

Carapace relatively large, long-oval in lateral view; anterior end equal to the posterior, anterior margin obliquely rounded, posterior margin broadly rounded, both of dorsal and ventral margins long and convex; the heighest at about one third from the anterior end of carapace; beak thick and short, notch shallow, surface smooth.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126451	left valve	1.53	0.80
126521	right valve	1.47	0.70

Locality and Horizon: Yurino of Wakamiya area, Fukuoka Prefecture of SW Japan; Upper Wakamiya Formation (W₄) of the Wakino Subgroup.

***Cypridea kyushuensis* sp. n.**

(Pl. 8, figs. 4–6)

Description: carapace moderate, subelliptical in lateral view; anterior margin broadly rounded with oblique upper part, posterior margin rounded; dorsal margin straight obliquely backwards, antero-dorsal angle broadly obtuse and slightly protruding above the dorsal margin, ventral margin somewhat concave in the middle part; the heighest at the anterodorsal angle; long-oval in dorsal view, carapace convex mediumly with the maximum width at its mid-posterior part; left valve slightly larger than the right and overlapping the latter especially in the ventral margin; beak small, notch shallow, surface smooth.

Dimensions (mm)				
Cat. no.	Valve	Length	Height	Width
126493	complete	0.92	0.50	0.40
126495	internal mould	0.98	0.52	0.40
126494	left internal mould	0.88	0.50	—

Remarks: It is similar to *Cypridea tentuis* Ruan from the Upper Cretaceous Yaojia formation of the Sungari Group in Jilin Province of NE China in outline, but the latter differs from this species in having larger carapace and clearly beak.

Locality and Horizon: Yurino of Wakamiya area, Fukuoka Prefecture; Upper Wakamiya Formation (W₄) of the late Lower Cretaceous Wakino Subgroup.

Subgenus *Bisulcocypridea* SOHN, 1969***Cypridea (Bisulcocypridea)* sp.**

(Pl. 8, fig. 12)

Only an uncompleted right valve of small size, long-oval in lateral view; anterior margin broadly rounded, posterior margin narrowly rounded, dorsal margin long and nearly straight, ventral margin substraight; the heighest at anterior part of the carapace; beak large; two short dorsal sulcus with two nodules before and behind them respectively; surface ornamented with reticulations.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126503	broken right valve	0.51	0.28

Locality and Horizon: Sugiyama River, Katsuyama City, Hida; late Lower Cretaceous Kitadani Formation of the Akaiwa Subgroup, Tetori Group.

Subgenus *Morinia* ANDERSON, 1939***Cypridea (Morinia) monosulcata zhejiangensis* YE**

(Pl. 8, figs. 1-3)

1980 *Cypridea (Morinia) monosulcata zhejiangensis* YE, YE *et al.*, p. 189, pl. 3, figs. 5-7.

Description: Carapace relatively large, suboblong in lateral view; anterior margin obliquely rounded, posterior margin quadratic-rounded, both of dorsal and ventral margins straight, and nearly parallel each other; antero-dorsal angle broadly obtuse and slightly protruding, a narrow and deep dorsal sulcus behind it, the dorsal sulcus curved back-downwards and its height equal one fourth of the height of carapace; beak large and long, notch deep, surface ornamented by fine reticulations.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126490	left valve	1.22	0.75
126491	left valve	1.28	0.63
126492	left valve without posterior end	0.79	0.60

Remarks: The present materials from Japan are very similar to *Cypridea (Morinia) monosulcata zhejiangensis* YE from the late Lower Cretaceous Guantou Formation of Zhejiang Province, SE China.

Locality and Horizon: Sugiyama River, Katsuyama City; Kitadani Formation of the Akaiwa Subgroup, Tetori Group.

Subgenus *Cyamocypris* ANDERSON, 1939***Cypridea (Cyamocypris) cf. oblonga* YE & GOU**

(Pl. 7, figs. 1-2)

Description: Carapace large, long-suboval in lateral view; anterior margin broadly rounded with oblique upper part, posterior narrowly rounded, dorsal margin slowly upheaved and oblique backwards, ventral margin convex; long and large beak equal to the half of height of carapace, notch deep, sculpture of carapace surface unclear.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126475	right valve	1.35	0.75
126476	left valve (broken)	1.30	0.72

Remarks: The materials of Dobaru are closely related to *Cypridea* (*Cyamocypris*) *oblonga* YE & Gou from the Guantou formation of Zhejiang Province, SE China in having similar outline of carapace and characteristic beak.

Locality and Horizon: Dobaru (DF-1), Kokura-minami-ku, Kitakyushu City of SW Japan; Sengoku Formation (W_1) of the Lower Cretaceous Wakino subgroup.

***Cypridea* (*Cyamocypris*) cf. *parva* YE & Gou**

(Pl. 7, figs. 4–5)

Description: carapace relatively large, broad-suboval in lateral view; anterior margin obliquely curved and the posterior narrowly rounded, dorsal margin slowly upheaved and oblique backwards, ventral margin convex; large and long beak equal to the half of height of carapace, notch deep, surface ornamentation unclear.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126478	right internal mould	1.18	0.73
126479	left internal mould	1.25	0.85

Remarks: It is similar to *Cypridea* (*Cyamocypris*) *parva* YE & Gou from the late Lower Cretaceous Guantou Formation of SE China in outline of carapace and in characteristic beak, but its ornamentation of surface is not clear due to ill-preserved.

Locality and Horizon: Dobaru (DF-1), Kokura-minami-ku, Kitakyushu City of SW Japan; Sengoku Formation (W_1) of the Wakino Subgroup.

Genus *Mongolocypris* SZCZECZURA, 1978

***Mongolocypris tera* (SU)**

(Pl. 9, figs. 1–2)

1959 *Cypridea tera* SU, NETCHAEVA *et al.*: p. 28, pl. 7, figs. 1a, b.

1974 *Cypridea tera* SU, HAO *et al.*: p. 35, pl. 10, fig. 1.

1986 *Mongolocypris tera* (SU), CAO: p. 244, pl. 3, figs. 6–8

These carapace figured in the present paper are extremely similar to those of *Cypridea tera* described by NETCHAEVA *et al.* (1959) from the Upper Cretaceous Yaojia and Nenjiang Formation of NE China, and also to those of *Mongolocypris tera* reported by CAO (1986) from the Hekou Formation in Fujian Province of SE China in outline of carapace.

Locality and Horizon: Kiwado of Yamaguchi Prefecture, SW Japan; Upper Cretaceous Ohmi Formation of the Abu Group.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126504	left valve	1.67	0.97
126505	left valve	1.73	1.07

***Mongolocypris cf. lenta* (Hou)**

(Pl. 9, figs. 3, 4, 9)

Description: Carapace relatively large, long-suboval in lateral view; dorsal margin slowly upheaved, ventral margin slightly convex in middle part, both of anterior and posterior margins fairly rounded; beak small, notch broad, surface smooth.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126506	right valve	1.77	1.00
126508	left valve	1.79	1.03
126519	left internal mould	1.86	1.10
126507	left internal mould	2.10	1.13

Remarks: It is very similar to *Mongolocypris lenta* (Hou) from the Upper Cretaceous Jiadian Formation of Hubei Province, central China with exception of narrower anterior end of carapace.

Locality and Horizon: Kiwado of Yamaguchi Prefecture, SW Japan; Upper Cretaceous Ohmi Formation of the Abu Group.

***Mongolocypris cf. subtera* (Hou)**

(Pl. 9, figs. 5–8, 10)

Description: Carapace large, subrounded to trapezoid in lateral view; dorsal margin straight at the middle part and parallel to the ventral margin, both of anterior and posterior margins nearly equal; the height at about central part of carapace; beak weak, notch shallow, surface smooth.

Remarks: There are many specimens preserved in moulds of single valve. They are similar to *Mongolocypris subtera* (Hou) from the Upper Cretaceous Jiadian Formation of Hubei Province, central China in outline of carapace.

Locality and Horizon: Kiwado of Yamaguchi Prefecture, SW Japan; Upper Cretaceous Ohmi Formation of the Abu Group.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126510	right internal mould	1.83	1.03
126513	left valve	1.93	1.07
126516	right valve	1.78	1.06
126517	right valve	1.70	0.97
126518	left internal mould	1.93	1.07
126520	right internal mould	2.12	1.15

Superfamily Darwinulacea BRADY & NORMAN, 1889

Family Darwinulidae BRADY & ROBERTSON, 1872

Genus *Darwinula* BRADY & NORMAN, 1889

***Darwinula* sp.**

(Pl. 5, fig. 10)

An ill-preserved right internal mould of small size, long-oval in lateral view; anterior margin narrowly rounded, posterior margin obliquely rounded, dorsal margin nearly straight; the highest at the posterior part of carapace.

Dimensions (mm)			
Cat. no.	Valve	Length	Height
126450	right internal mould	0.72	0.28

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture of SW Japan; Yamaji Shale of the Lower Cretaceous Inakura Formation.

Superfamily Cytheracea BAIRD, 1850

Family Cytheridae BAIRD, 1850

Genus *Timiriasevia* MANDELSTAM, 1947

***Timiriasevia* sp.**

(Pl. 5, fig. 14; Pl. 6, fig. 14)

There are only two specimens: a right valve and another right external mould with extruding deformation, but the characteristic elliptic striations which are somewhat parallel each other and to the peripheral margins of carapace for this genus are preserved.

Locality and Horizon: Yamaji of Ibara City, Okayama Prefecture and Sugiyama River, Katsuyama City, Hida; Kitadani Formation of the Akaiwa Subgroup and Yamaji Shale of the Inakura Formation.

Cat. no.	Dimensions (mm)		
	Valve	Length	Height
126457	left valve	0.67	0.38
126476	right external mould	0.69	0.44

Acknowledgments

The writer wishes to express her sincerity thanks to Drs. M. OTA, Y. YABUMOTO, JING Fan and Profs. M. M. CHANG and P. J. CHEN for their helps and also to NSFC and KMNH for supporting this researching. This study was supported partially by a grant from Fujiwara Natural History Foundation.

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Nonmarine Cretaceous Ostracods from Inner
Zone of SW Japan

CAO Mei-zhen

Plates 5-9

Explanation of Plate 5

Figs. 1–3. *Rhinocypris* cf. *jurassica jurassica* (MARTIN)

1. Left internal mould $\times 87$, Cat. No. 126439.
2. Left internal mould $\times 69$, Cat. No. 126440.
3. Right internal mould $\times 69$, Cat. No. 126441.

Yamaji Shale of the Inakura Formation, Yamaji, Ibara City, Okayama Prefecture.

Fig. 4. *Rhinocypris* sp. 1

Right internal mould $\times 87$, Cat. No. 126443.

Upper Wakamiya Formation (W₄); Yurino, Wakamiya Area, Fukuoka Prefecture.

Fig. 5. *Rhinocypris* sp. 2

Left internal mould $\times 69$, Cat. No. 126445.

Upper Wakamiya Formation (W₄); Yurino, Wakamiya Area, Fukuoka Prefecture.

Fig. 6. *Rhinocypris* sp. 3

Right internal mould $\times 87$, Cat. No. 126446.

Ohmi Formation, Kiwado; Yamaguchi Prefecture.

Figs. 7–9. *Candona* cf. *disjuncta* HAO

7, 8. Left internal mould $\times 52$, Cat. No. 126447, 126448.

9. Right internal mould $\times 52$, Cat. No. 126449.

Ohmi Formation; Kiwado, Yamaguchi Prefecture.

Fig. 10. *Darwinula* sp.

Right internal mould $\times 69$, Cat. No. 126450.

Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.

Fig. 11. *Cypridea* sp. 4

Outside view of left valve, $\times 34$, Cat. No. 126451.

Upper Wakamiya Formation (W₄); Yurino, Wakamiya Area, Fukuoka Prefecture.

Fig. 12. *Ziziphocypris simakovi* (MANDEL.)

Left internal mould $\times 69$, Cat. No. 126452.

Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.

Fig. 13. *Ziziphocypris costata* (GALEEVA)

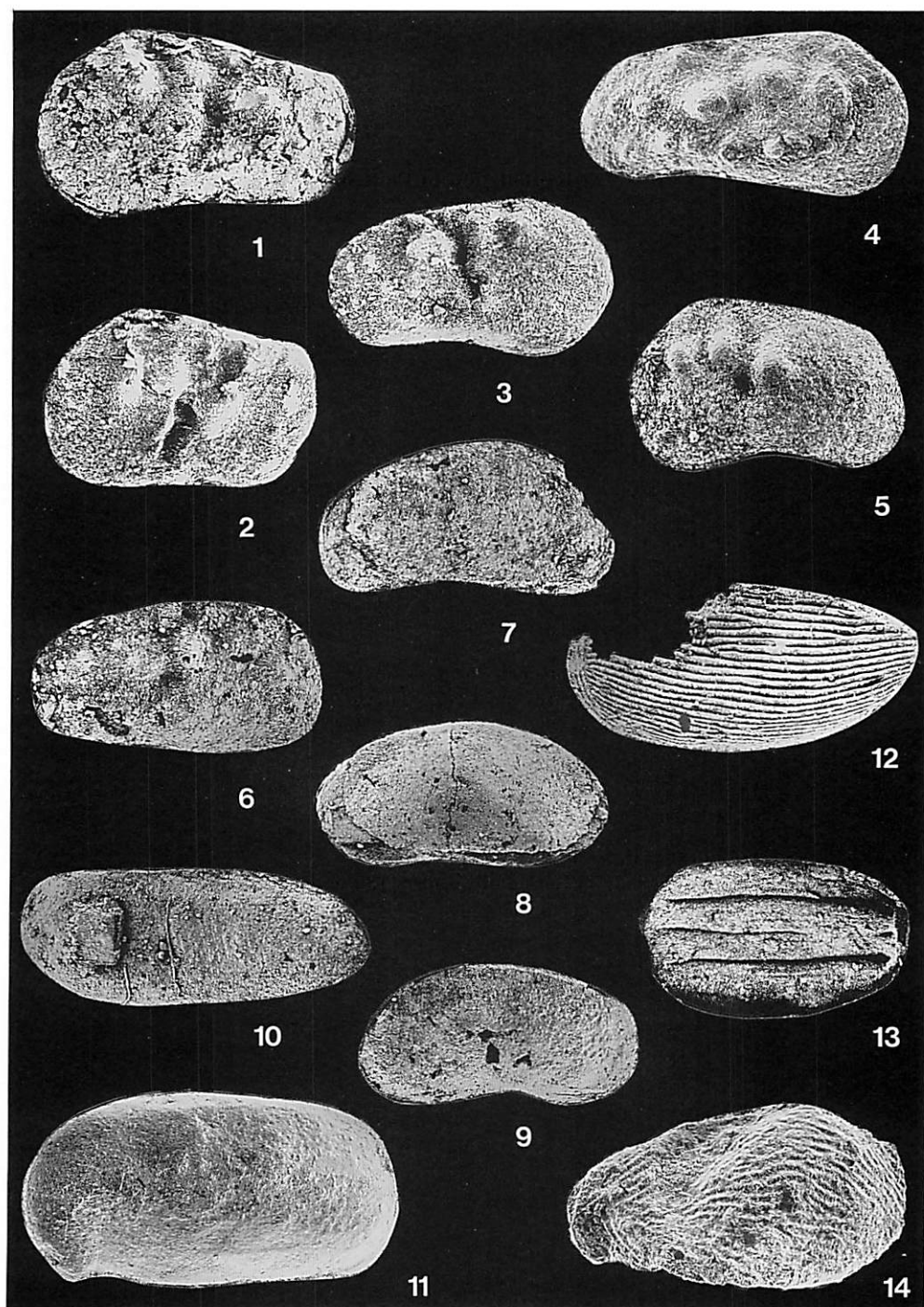
Right internal mould $\times 69$, Cat. No. 126455.

Ohmi Formation; Kiwado, Yamaguchi Prefecture.

Fig. 14. *Timiriasevia* sp.

Outside view of left valve, $\times 69$, Cat. No. 126457.

Kitadani Formation; Sugiyama River, Katsuyama City, Hida.



Explanation of Plate 6

Figs. 1–7. *Cypridea* cf. *anhuaensis* YE et GOU

- 1, 4, 5. Left internal mould $\times 52$, Cat. No. 126458, 126462, 126463.
 - 2, 3, 6. Left internal mould $\times 43$, Cat. No. 126459, 126461, 126464.
 - 7. Right internal mould $\times 52$, Cat. No. 126465.
- Yamaji Shale of the Inakura Formation; Yamaji Ibara City, Okayama Prefecture.

Figs. 8–11. *Cypridea* cf. *linghaiensis* YANG et YE

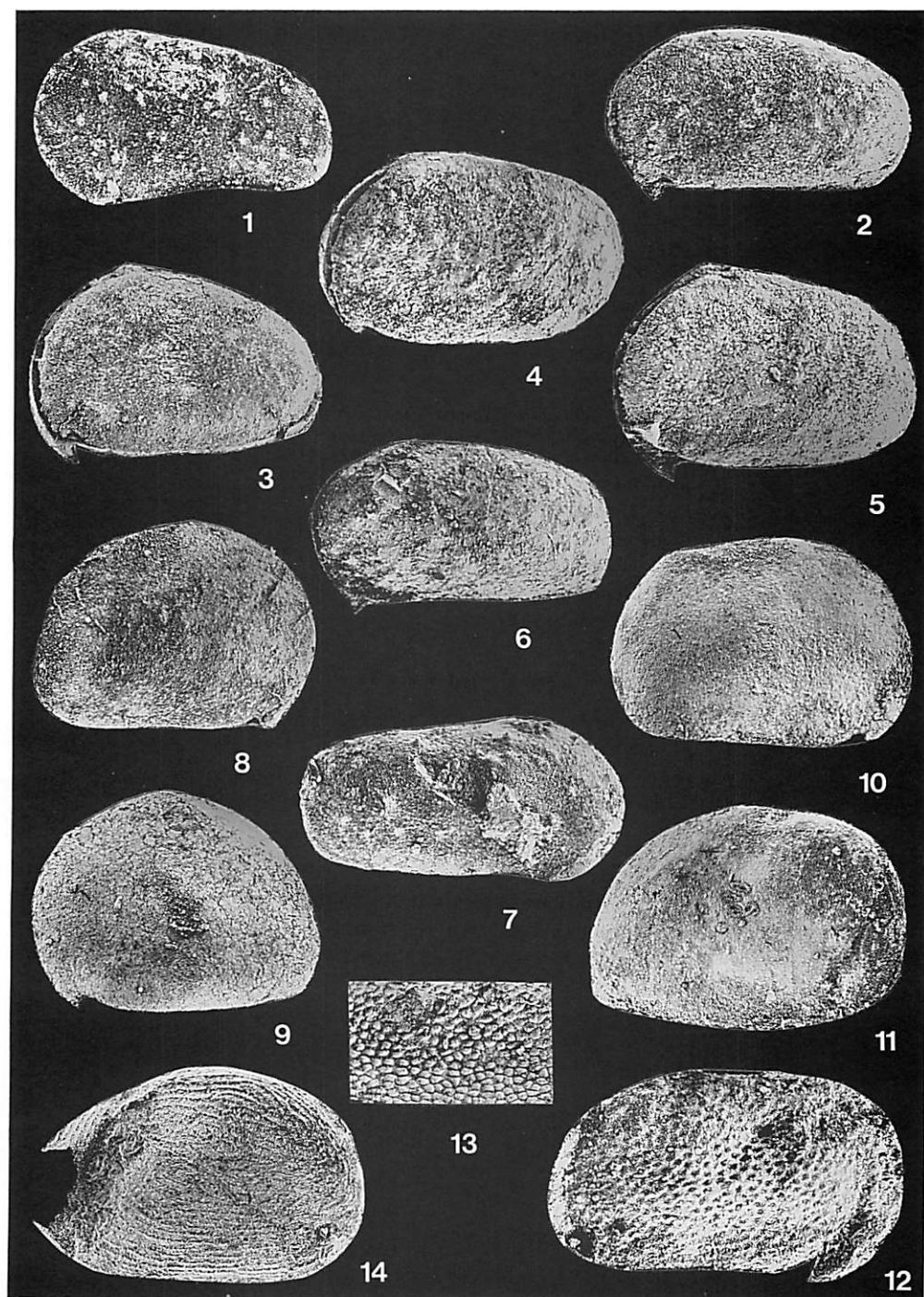
- 8, 10. Right internal mould $\times 34$, Cat. No. 126466, 126468.
 - 9, 11. Left internal mould $\times 34$, Cat. No. 126467, 126469.
- Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.

Figs. 12–13. *Cypridea* sp. 1

- 12. Right internal mould $\times 69$, Cat. No. 126471.
 - 13. Detail of external mould $\times 69$, Cat. No. 126472.
- Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.

Fig. 14. *Timiriasevia* sp.

- Left external mould $\times 69$, Cat. No. 126474.
- Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.



Explanation of Plate 7

Figs. 1, 2. *Cypridea (Cyamocypris) cf. oblonga* YE et GOU

1. Right internal mould $\times 34$, Cat. No. 126475.
 2. Left internal mould $\times 34$, Cat. No. 126476.
- Sengoku Formation (W_1); Dobaru (DF-1), Kokura-minamiku, Kitakyushu City.

Figs. 3, 9–13. *Cypridea cf. yangtuensis* YANG et YE

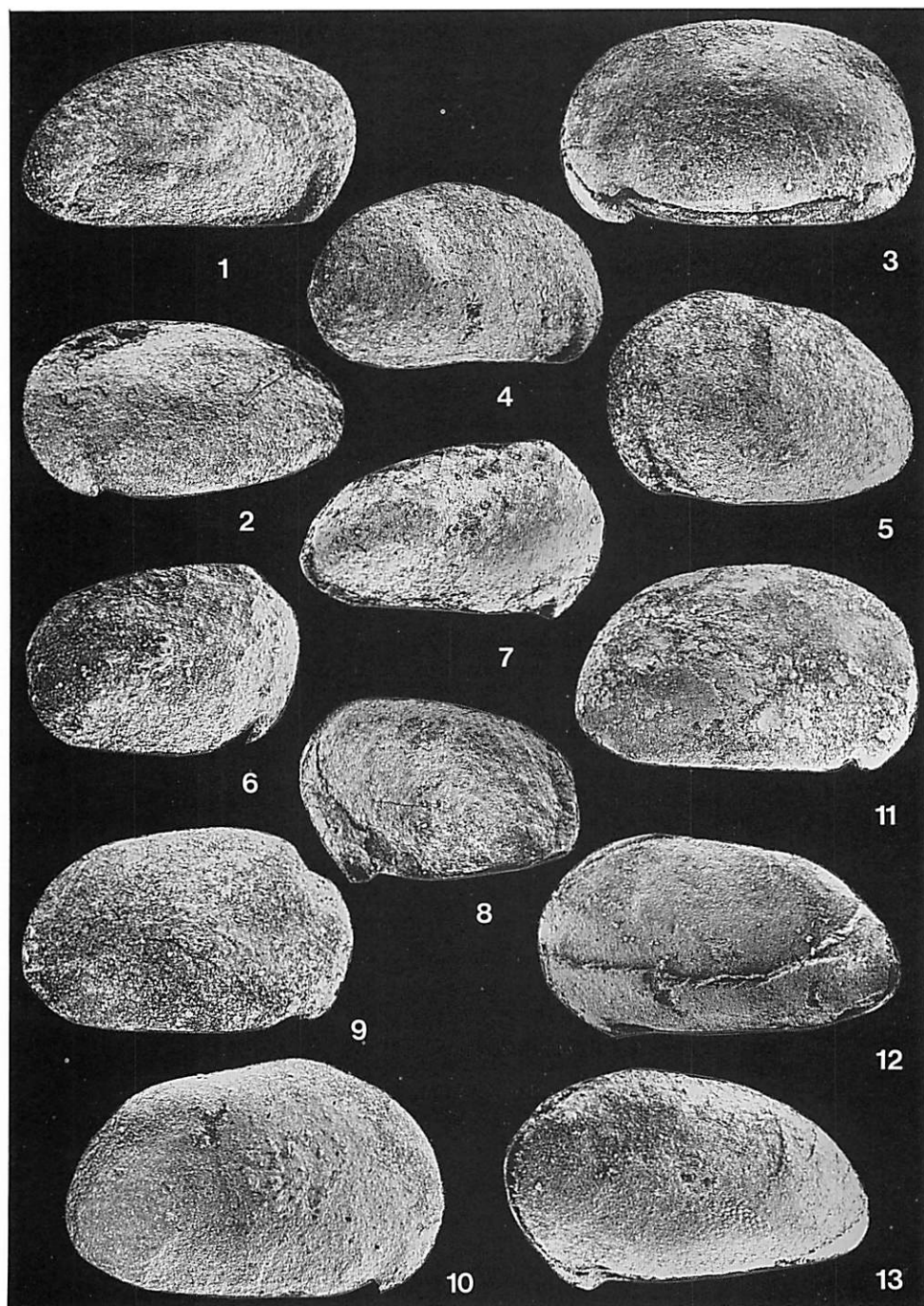
3. Left internal mould $\times 43$, Cat. No. 126477.
 9. Right internal mould $\times 34$, Cat. No. 126484.
 10. Right internal mould $\times 43$, Cat. No. 126485.
 11. Right internal mould $\times 34$, Cat. No. 126486.
 - 12, 13. Left internal mould $\times 34$, Cat. No. 126487, 126488.
- Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.

Figs. 4, 5. *Cypridea (Cyamocypris) cf. parva* YE et GOU

4. Right internal mould $\times 34$, Cat. No. 126478
 5. Left internal mould $\times 34$, Cat. No. 126479.
- Sengoku Formation (W_1); Dobaru (DF-1), Kokura-minamiku, Kitakyushu City.

Figs. 6–8. *Cypridea* sp. 2

- 6, 7. Right internal mould $\times 43$, Cat. No. 126480, 126482.
 8. Left internal mould $\times 43$, Cat. No. 126483.
- Lower Wakamiya Formation (W_3); Minamigaoka (MF-1), Kitakyushu City.



Explanation of Plate 8

Figs. 1–3. *Cypridea (Morinia) monosulcata zhejiangensis* YE

1, 2. Outside view of left valve $\times 34$, Cat. No. 126490, 126491.

3. Outside view of left valve $\times 43$, Cat. No. 126492.

Kitadani Formation; Sugiyama River, Katsuyama City, Hida.

Figs. 4–6. *Cypridea kyushuensis* sp. nov.

4. Right view of holotype $\times 43$, Cat. No. 126493.

5, 6. Left view of paratype $\times 43$, Cat. No. 126494, 126495.

Upper Wakamiya Formation (W_4); Yurino, Wakamiya Area, Fukuoka Prefecture.

Figs. 7–9. *Cypridea angusticaudata* CAO et YANG

7, 9. Outside view of right valve $\times 52$, Cat. No. 126496, 126498.

8. Outside view of right valve $\times 54$, Cat. No. 126497.

Kitadani Formation; Sugiyama River, Katsuyama City, Hida.

Fig. 10. *Cypridea* sp. 3

Outside view of left valve $\times 52$, Cat. No. 126501.

Upper Wakamiya Formation (W_4), Yurino, Wakamiya Area, Fukuoka Prefecture.

Fig. 11. *Cypridea* cf. *yangtzensis* YANG et YE

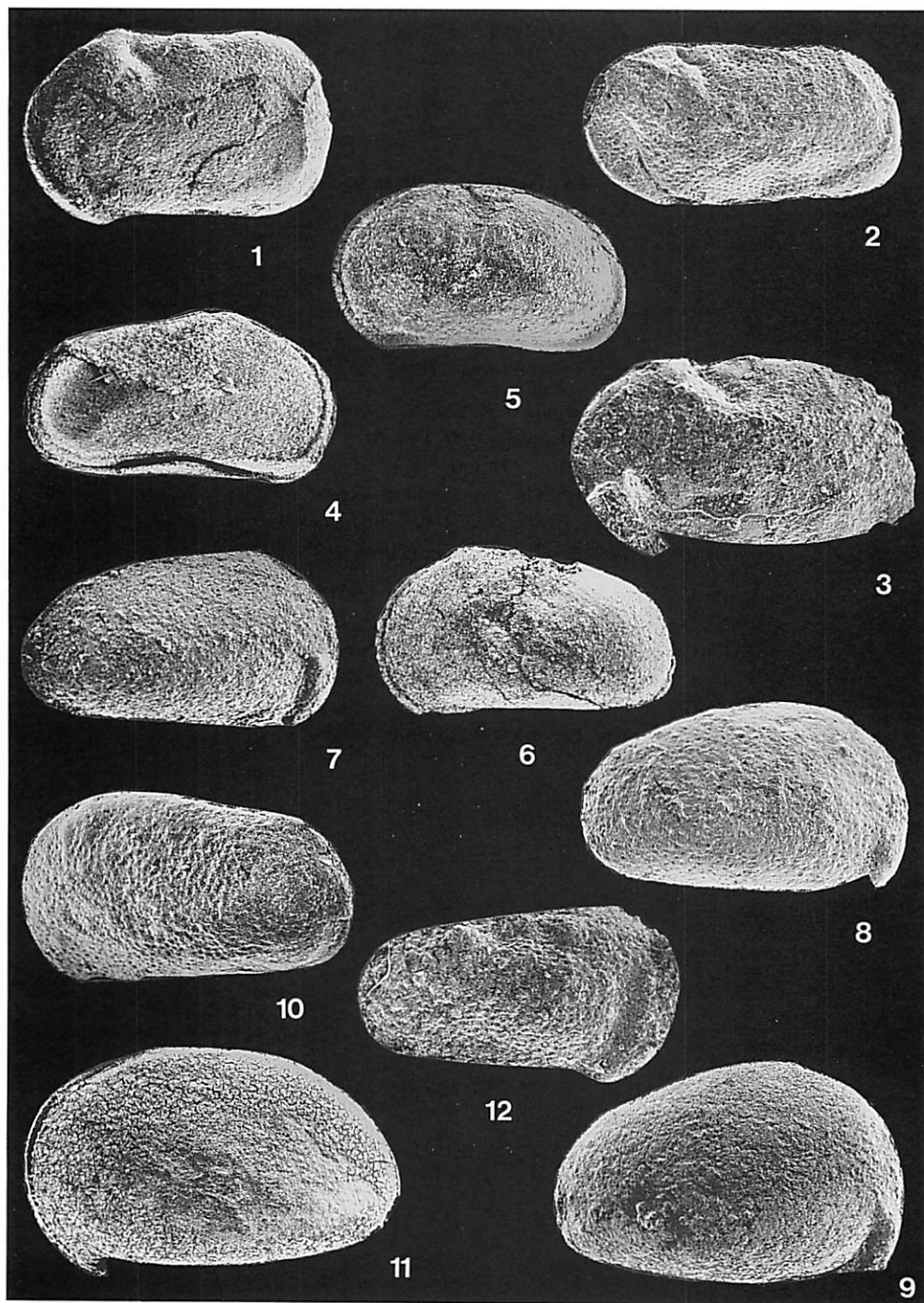
Left internal mould $\times 34$, Cat. No. 126502.

Yamaji Shale of the Inakura Formation; Yamaji, Ibara City, Okayama Prefecture.

Fig. 12. *Cypridea (Bisulcocypridea)* sp.

Outside view of right valve $\times 87$, Cat. No. 126503.

Kitadani Formation; Sugiyama River, Katsuyama City, Hida.



Explanation of Plate 9

Figs. 1, 2. *Mongolocypris tera* (Su)

Right internal mould $\times 26$, Cat. No. 126504, 126505.
Ohmi Formation; Kiwado, Yamaguchi Prefecture.

Figs. 3, 4, 9. *Mongolocypris* cf. *lenta* (Hou)

3. Right internal mould $\times 26$, Cat. No. 126506.
4. Outside view of left valve $\times 28$, Cat. No. 126508.
9. Left internal mould $\times 32$, Cat. No. 126519.
Ohmi Formation; Kiwado, Yamaguchi Prefecture.

Figs. 5–8, 10. *Mongolocypris* cf. *subtera* (Hou)

5. Right internal mould $\times 26$, Cat. No. 126510.
6. Left internal mould $\times 26$, Cat. No. 126513.
7. Outside view of left valve $\times 26$, Cat. No. 126513.
8. Outside view of right valve $\times 28$, Cat. No. 126516.
10. Outside view of right valve $\times 32$, Cat. No. 126517.
Ohmi Formation; Kiwado, Yamaguchi Prefecture.

